

Innovative Hybridsil Poly(Siloxane Imide) Composite Repair Materials and Methods, Phase I

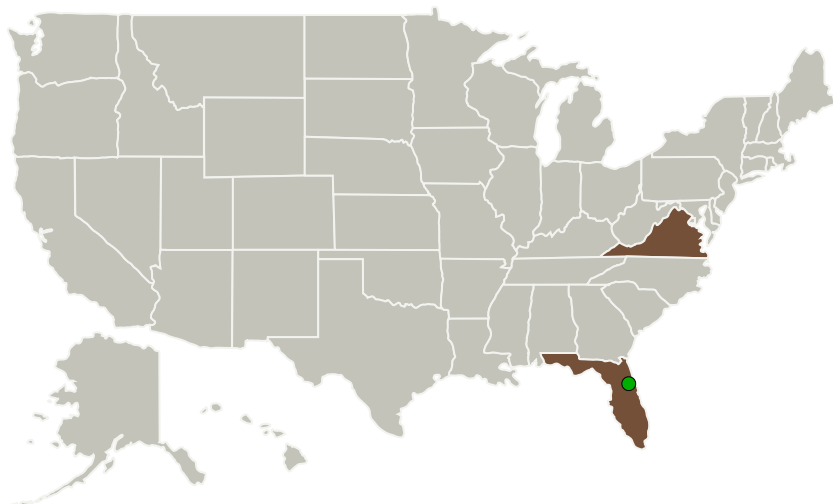
Completed Technology Project (2016 - 2017)



Project Introduction

Through the proposed STTR program, NanoSonic and Virginia Tech will create an innovative low viscosity, high Tg copolymer injection repair material and methodology that enables fiber reinforced composite repair within a short time frame in areas with limited user access. The proposed injection repair material will consist of fluidic HybridSil poly(siloxane imide) resins that are molecularly engineered to 1) rapidly infiltrate microcracks within damaged composites areas, 2) covalently bond to functionalized composite fibers for exceptional adhesion and mechanical restoration, and 3) cure on the order of minutes through moisture sensitive moieties. NanoSonic's composite repair material will contain novel, phase separated morphologies that provide highly efficient load transfer pathways within damaged composite areas, high temperature durability (> 450 oC), and self-leveling properties during curing to provide optimal aerodynamic efficiency. The major phase of the repairing material will consist of a high Tg (> 250 C) polyimide matrix while the minor phase will consist of low Tg (<-100 oC), microphase separated polysiloxanes. A facile three step repair process will be established that involves 1) the priming of composite surface with reactive functional groups through a surface wipe down, 2) defect infusion with reactive nanocomposite resin, and 3) a moisture induced crosslinking reaction. In support of a rapid Phase III transition, NanoSonic's HybridSil polymeric resins have a current production capacity of 8,000 lbs. / day, a MRL of 4, and have been integrated onto combat active DoD platforms for trial demonstrations.

Primary U.S. Work Locations and Key Partners



INNOVATIVE HYBRIDSIL
POLY(SILOXANE IMIDE)
COMPOSITE REPAIR MATERIALS
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Organizations Performing Work	Role	Type	Location
Nanosonic, Inc.	Lead Organization	Industry	Pembroke, Virginia
● Kennedy Space Center(KSC)	Supporting Organization	NASA Center	Kennedy Space Center, Florida
Virginia Polytechnic Institute and State University(VA Tech)	Supporting Organization	Academia	Blacksburg, Virginia

Primary U.S. Work Locations

Florida	Virginia
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Images



Briefing Chart Image

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AND METHODS, Phase I
(<https://techport.nasa.gov/image/134394>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Nanosonic, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

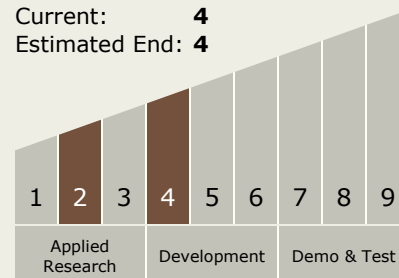
Carlos Torrez

Principal Investigator:

Victor V Baranauskas

Technology Maturity (TRL)

Start: 2
Current: 4
Estimated End: 4



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Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.1 Materials
 - └ TX12.1.1 Lightweight Structural Materials

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System